

## **REMARKS**

Favorable reconsideration is respectfully requested in view of the foregoing amendments and the following remarks.

### **I. CLAIM STATUS AND AMENDMENTS**

Claims 1-13 were pending in this application when last examined.

Claims 1-4 and 10-13 were examined on the merits and rejected.

Claims 5-9 were withdrawn as non-elected subject matter. Applicants respectfully request rejoinder of such claims upon allowance of the pending subject matter.

Claims 1-3 and 11-12 are currently amended.

Support for the amendment to claim 1 can be found in paragraph [0025] and paragraph [0026] on page 6 of the application as filed.

All other claim amendments are to correct informalities.

Claims 4 and 13 are canceled with any prejudice or disclaimer thereto. Applicants reserve the right to file a divisional or continuation application on any canceled subject matter.

No new matter has been added.

### **II. CLAIM OBJECTION**

On page 2 of the Office Action, claim 3 was objected to for the word "belonging". Applicants note that this objection is overcome, as applied to amended claim 3, for reasons which are self-evident.

### **III. INDEFINITENESS REJECTION**

On page 3 of the Office Action, claims 3, 4, 12 and 13 were rejected under 35 U.S.C. § 112, second paragraph, as indefinite.

In regard to claims 3 and 12, Applicants suggest that this rejection, as applied to the amended claims, is overcome for reasons which are self-evident.

Further, in regard to claims 4 and 13, this rejection is moot as these claims have been

canceled.

#### **IV. NON-STATUTORY SUBJECT MATTER REJECTION**

On pages 3-5 of the Office Action, claims 1-4 and 10-14 were rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Applicants respectfully traverse this rejection, as applied to the amended claims, for the following reasons.

Claim 1 is amended to be directed towards a product made by the process of selectively collecting alga bodies, washing the matured portions of the tetrasporophytes of the collected alga bodies, keeping the matured portions standing to cause release of spores, and culturing said spores. Applicants therefore suggest that claim 1, as amended, is directed towards a product that is not found in nature and therefore this rejection is overcome and should be withdrawn.

#### **V. ANTICIPATION/OBVIOUSNESS REJECTIONS**

On pages 6-8 of the Office Action, claims 1-4 and 10-13 were rejected under 35 U.S.C. § 102(b) as anticipated by Hirota (2000) or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Hirota (2000) in view of Hirota (2001). Applicants respectfully traverse this rejection as applied to the amended claims for the following reasons.

Applicants note that, as way of background, the life cycle of *Gracilaria chorda* is an isomorphic alternation of generation and the alga body of *Gracilaria chorda* includes female gametophytes, male gametophytes and tetrasporophytes. Spermatium released from a matured male gametophyte fertilizes the carpogonia attached to the female gametophyte to produce a carposporangium. Carpospores are released from the carposporangium of a matured female gametophyte. The carpospores are divided and germinated to form tetrasporophytes and then the tetrasporophytes grow and mature to form tetrasporangia. Tetraspores are released from the tetrasporangia and then divide and germinate to produce female or male gametophytes thus completing the life cycle.

Marine macroalgae of red algae, e.g., *Gracilaria chorda*, are suitable for culturing since they have following advantages: (1) they are easily controlled and collected since they can be

immobilized on carriers and cultured by virtue of their robust, less cleavable alga bodies; (2) their light-receiving efficiency does not decrease with increasing density of growing alga bodies; (3) they can grow even under weak light; (4) they are resistant to decay; (5) there is no environmental pollution caused by maturation and withering; and (6) they are suitable for large-scale culture.

Unfortunately, during long-term culture, unialgal culture strains mature and wither, thus making storage difficult. Further, during long-term culture, adhering algae (i.e., epiphyte) attach to the unialgal culture strains and ingest nutrients in the culture media, inhibiting the growth of the unialgal culture strains and possibly withering them in the worst cases.

However, the present inventors have found that there are alga bodies suitable for long-term storage having characteristics that no female gametophytes are detectable as matured bodies and only tetrasporophytes are detectable as matured bodies among alga bodies of *Gracilaria chorda* growing in natural seawater area with intermixing of fresh water. No detection of matured female gametophytes in nature means that tetraspores, a starting point of female gametophytes, produce immatured female gametophytes. In other words, it means that maturation is inhibited in the female gametophytes resulted from the germination of tetraspores.

The claimed inventions set forth in amended claims 1-4 relate to an immaturable unialgal culture strain having the advantages, but none of the disadvantages, noted above. The claimed invention is obtained by separating spores from algae having characteristics that no matured female gametophytes are detectable and only matured tetrasporophytes are detectable as matured bodies, germinating the separated spores in sterilized seawater or sterilized water, and culturing the obtained upright bodies. The claimed inventions set forth in amended claims 10-12 relate to an alga body obtained by growing the immaturable unialgal culture strain according to claim 1.

In Example 2 of the specification (pp. 13-23), the spores used were released from matured sporophytes of the selected *Gracilaria* sp. in which no female gametophytes are detectable and only tetrasporophytes are detectable as matured bodies. On the other hand, in Comparative Examples 1 and 2 of the specification (pp. 24-27), the spores used were released from tetrasporophytes of algae not selected in the above-mentioned manner, that is to say, the

tetrasporophytes were selectively collected from a group of algae including matured female gametophytes and tetrasporophytes.

Accordingly, the unialgal culture strain obtained in Example 2 did not mature even after 3 years or more, whereas the unialgal culture strain of Comparative Example 1 matured in 12 weeks and the unialgal culture strain of Comparative Example 2 matured in 11 weeks. As was explained above, the absence of matured female gametophytes means that tetraspores, a starting point of female gametophytes, produce immature female gametophytes. In other words, maturation is inhibited in female gametophytes produced by germination of tetraspores (See Table 4 on pg. 17).

Applicants note that the algae disclosed in Hirota (2000) correspond to that in Comparative Example 1. Since Hirota (2000) did not selectively collect algae in which no female gametophytes were detectable and only tetrasporophytes are detectable as matured bodies, a unialgal culture strain obtained from the algae disclosed in Hirota (2000) would mature in 12 weeks and therefore lack storage stability. Detection of matured female gametophytes means that tetraspores, a starting point of female gametophytes, are susceptible to producing matured female gametophytes. Thus, it is highly likely that maturation of female gametophytes from the germination of tetraspores will occur.

Accordingly, the claimed culture strain set forth in amended claims 1-4 and 10-13 is not the same as the invention disclosed in Hirota (2000).

In addition, Hirota (2001) merely teaches a technique of culturing the spores of *Gracilaria chorda* from the same source as Hirota (2000) and does not teach anything about selection of algae in which no female gametophytes are detectable and only tetrasporophytes are detectable as matured bodies.

Thus, Applicants respectfully suggest that these rejections are untenable and should be withdrawn because neither Hirota (2000) or the combination of Hirota (2000) and Hirota (2001) teach or suggest a culture strain suitable for long-term storage produced by selectively collecting alga bodies, which have characteristics that no female gametophytes are detectable and only tetrasporophytes are detectable, from among mature bodies of marine macroalgae of red

algae growing in a natural seawater area with intermixing of fresh water. Thus, the cited references fail to teach or suggest the claimed algal strain suitable for long-term storage.


**CONCLUSION**

In view of the foregoing amendments and remarks, the present application is in condition for allowance and early notice to that effect is hereby requested.

If the Examiner has any comments or proposals for expediting prosecution, please contact the undersigned attorney at the telephone number below.

Respectfully submitted,

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